The Competitive Effects of Online Education

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Executive Summary

In this paper, we study the impact of online degree programs on the market for U.S. higher education. Online degree programs increase the competitiveness of local education markets by providing additional options in areas that previously only had a small number of brick-and-mortar schools. We show that local postsecondary institutions in less competitive markets experienced relative enrollment declines following a regulatory change in 2006 that increased the market entry and enrollment of online institutions. These impacts on enrollment were concentrated among private non-selective institutions, which are likely to be the closest competitors to online degree programs. Our results indicate that these schools also increase tuition in order to offset some of the revenue losses coming from enrollment declines but that per-student instructional spending does not decrease. This suggests a relative shifting of resources towards instruction due to online competition in the private, nonselective postsecondary sector. We also find increases in per-student instructional spending among public institutions. Our results suggest that by increasing competitive pressure on local schools, online education can be an important driver of innovation and productivity in U.S. higher education.

Online education is an increasingly important component of the U.S. higher education landscape. In 2014, one in three college students in degree-granting U.S. institutions took at least one course online (Allen and Seaman, 2015). Millions of students from all over the world also have enrolled in Massive Open Online Courses (MOOCs) offered in partnership with major research universities such as Harvard, MIT and Stanford (Ho et al. 2014, McPherson and Bacow 2015, Waldrop 2014). By 2012, more than 6 percent of all U.S. bachelor's degrees were awarded online (Deming et al. 2016). The rapid rise of online course offerings and degrees has led to predictions that competition from MOOCs and other online course offerings will lead to "disruptive innovation" in higher education (e.g. Christensen and Eyring 2011, Cowen and Tabarrok 2014). While there is a growing body of research examining student outcomes among those enrolling in online degree programs or courses (Deming et al. 2016, Bettinger et al. 2014), no prior work has estimated the impact of this change in higher education markets on brick and mortar schools.

The exuberance over MOOCs obscures the fact that most of the growth in online education has been among the least selective institutions, especially for-profit colleges (Deming, Goldin and Katz 2012). In 2013, selective institutions accounted for only about 2 percent of enrollment in fully online programs, compared to 33 percent for the for-profit sector (Deming et al. 2015).[1] Online for-profits spend very little per student, and are viewed less favorably by employers than non-selective brick and mortar schools of all types (Deming et al. 2016).

For public institutions, the allure of online education lies in its potential to cut costs in a time of declining state support and tightening budgets (Bowen et al. 2014). Yet cost savings from larger classes and less student-faculty contact may cause instructional quality to suffer, and high quality online courses are – at least at the time of writing – equally or even more expensive to develop and staff than in-person courses (McPherson and Bacow 2015).[2]

In this paper, we ask whether online degree programs can improve educational productivity by exerting competitive pressure on traditional brick-and-mortar institutions. How might competition from online providers affect the market for higher education? In a well-functioning

[1] We define selective institutions as those that received a rating of Most Competitive, Highly Competitive or Very Competitive according to the 2009 Barron's Profile of American Colleges.
[2] Several recent studies conducted in a wide variety of institutions find that online course-taking reduces student learning and lowers persistence through college (Figlio, Rush and Yin 2013, Xu and Jaggars 2013, Hart, Friedman and Hill 2014, Streich 2014, Bettinger et al. 2016). Bowen et al. (2014) compare student performance in a fully online statistics course to a hybrid version across six different public research universities and find no difference in learning.

marketplace, the new availability of a cost-saving technology should increase efficiency, because colleges compete with each other to provide the highest quality education at the lowest price. Indeed, the market for selective colleges is highly competitive and increasingly geographically integrated, however these colleges also compete fiercely on the quality margin (Hoxby 1997, Hoxby 2009, Clotfelter 1999).

Although the market for elite colleges is geographically integrated, the vast majority of students in non-selective colleges attend school close to their home and in their home state. In 2013, 39.3 percent of students at selective colleges were from out-of-state, compared to just 13.8 percent of students in less selective four-year schools and only 5.6 percent in community colleges.

While education markets still can be locally competitive, there are a few reasons to suspect that many are not. First, public colleges and universities are heavily subsidized by state and local governments and face political pressure to keep tuition low. As a result, prices at public institutions are often set below marginal cost, which drives out private competitors who are not receiving such subsidies. Second, for political and historical reasons, public institutions are often located in communities that are not populous enough to support private competitors.

As a result of the uneven geographic dispersion of postsecondary schools and the high probability that students enrolling in nonselective schools attend close to home, non-selective public institutions in less dense areas either are local monopoly providers of education or have considerable market power. Online education has the potential to disrupt these local monopolies by introducing competition from alternative providers that do not require students to leave home to attend. The impact of competition from online providers will depend on the degree of monopoly power held by incumbents as well as on the extent to which students are willing to substitute between online and in-person programs.

We analyze the impact of increases in prevalence and market share of online institutions on student outcomes and institutional behavior at traditional brick-and-mortar schools. Studying the impact of competitive pressure from online institutions on local education markets is inherently difficult, for two reasons. First, competitive pressure is challenging to measure directly, especially since there is sparse data on online degree programs offered by traditional brick and mortar schools. Second, it is difficult to isolate the impact of competition from online institutions from other changes affecting the market for higher education, because online degree programs by nature are available everywhere at the same time.

We address these challenges by exploiting a 2006 change in the Federal regulation of online education called the 50 percent rule. As we discuss later, this regulatory change allowed institutions to specialize in the provision of online degrees and dramatically lowered barriers to entry into online education. Deming et al. (2015), show that the median price of an online degree dropped by 34 percent between 2006 and 2013, suggesting that online degree providers were competing with each other for students. While the regulatory change was national, we argue that it should affect local education markets differently depending on their level of competitiveness prior to 2006.

We measure competitiveness using the Herfindahl index, a standard measure of market concentration. High values of the Herfindahl index indicate that postsecondary enrollment is concentrated in a small number of institutions that are likely to enjoy monopoly power. We compare changes in enrollment, prices and other outcomes to changes after 2006 in markets with more or less market concentration in a generalized differences-in-differences framework. We define education "markets" as the Metropolitan Statistical Areas (MSA) or county if a county is not in an MSA. Finally, we calculate a Herfindahl index as of the year 2000, which predates the spread of online education.

Taken together, our results align with theoretical predictions of how schools should react to increased competition. We find that the impact of online competition on enrollment, prices and education resources as measured by per-student instructional spending is greater in markets where pre-online enrollment was concentrated in a smaller number of institutions. In particular, we show that a one standard deviation increase in the Herfindahl index decreases enrollment after 2006 in non-selective schools by 2.0% (or 110 students) and increases instructional expenditures per student by 1.6% (or $2,976). The impacts on enrollment are largest among not-for-profit and for-profit institutions. However, the impacts on per-student instructional expenditures are largest in the public sector and among 4-year schools.

We also examine the effect of online competition on tuition prices. We restrict our analysis to private schools because public school tuition is heavily subsidized and is unlikely to reflect market forces. We find that online competition increases average tuition, particularly in the private four-year sector and that it is associated with increased tuition dispersion, especially in the private two-year sector. One possible explanation is that tuition increases are a response to revenue losses associated with enrollment reductions from online competition. Additionally, most online institutions are for-profits that charge high prices and serve students who are heavily subsidized by Federal Title IV financial aid. If students do not face the full cost of their education when making enrollment decisions, quality competition may be more salient than price competition.

A second approach we take to identifying the competitive effects of online education programs is to use the differential spread of Internet availability across states (Goolsbee, Lovenheim and Slemrod 2010). Since online enrollment requires access to the Internet, competitive pressures from online schools should be larger in areas with more Internet access. A drawback of this approach is that we only have comprehensive Internet penetration data at the state level, which necessitates defining education markets in a more aggregated manner. Thus, this is not our preferred approach but provides supporting evidence of our market concentration results using a very different source of variation.

Similar to the market concentration analysis, we employ a difference-in-difference estimator that examines how postsecondary outcomes change as a function of Internet penetration rates after 2006 when online schools became more prevalent. Thus, we estimate whether there was a change in the relationship between state Internet access and brick-and-mortar postsecondary outcomes in 2006. Our findings are broadly consistent with those from the market power analysis: Internet penetration growth post-2006 is associated with decreased log enrollment, and higher per-student instructional expenditures.

Overall, our results suggest that there may be important general equilibrium effects of online degree programs on the market for higher education. Data restrictions preclude us from obtaining first-stage effects of the variation we use on competitive pressures, which leads to our reduced-form analysis. Furthermore, our analysis looks only at enrollment, tuition and resource changes; competition also could alter instructional methods in traditional institutions or other types of resources. Nonetheless, our results suggest that the general equilibrium impacts of online schools on the market for higher education should not be ignored by policymakers and researchers.

I. A Brief History of Online Education in the U.S.

Long before the Internet, distance education took the form of correspondence courses that delivered lessons by mail, radio and television. U.S. colleges and universities such as University of Maryland University College (UMUC) and the University of Wisconsin-Extension have been offering correspondence courses in some form for nearly a hundred years.

Fully online degrees were developed in the mid-1990s, when dial-up Internet started to become available for commercial use. Early examples of such programs include CALcampus and Western Governors University. The first postsecondary institution to open an online campus was the University of Phoenix, which enrolled more than 1,200 students in the 1994-1995 academic year, according to data from the U.S. Department of Education Integrated Postsecondary Education Data System (IPEDS).

The for-profit sector moved relatively slowly into online education. By 2000, only a handful of for-profits had online degree programs at all. One reason was technological – in 2000 only 37 percent of Americans had Internet connections at home, and only 3 percent had high-speed broadband access (Pew Charitable Trusts 2016). By 2005, more than 60 percent of Americans had Internet access, and broadband access grew eleven-fold to 33 percent.

Regulatory restrictions also played an important role in the growth of online degree programs. The Higher Education Act (HEA) of 1992 required that schools distributing Federal Title IV aid have no more than 50 percent of total student course time spent in distance education (the 50 percent rule). The rule was interpreted broadly to include mail-in correspondence courses as well as online degree programs.

The 50 percent rule did not prevent schools from offering online degrees, but it did limit market entry by effectively requiring all institutions to enroll one student in-person for every student enrolled online. Specialized online schools could not exist under the 50 percent rule. The 1998 HEA created the Distance Education Demonstration Program (DEDP), a pilot program that allowed waivers of the 50 percent rule for selected institutions. Notable participants included University of Phoenix, Capella University, and Western Governors University. Online enrollment grew rapidly among DEDP participants between 1998 and 2005, and in February of 2006 the Higher Education Reconciliation Act (HERA) eliminated the 50 percent rule.

These regulatory changes had a large impact on enrollments in online programs. IPEDS only began tracking online enrollment directly in 2013, but the data are collected at the campus branch level. This makes it possible to measure enrollment at individual branches of “chain” institutions with multiple campuses, such as the University of Phoenix. We estimate online enrollment using the method outlined in Deming, Goldin and Katz (2012), which classifies a school campus as online if it has the word “online” in its name or if no more than 33 percent of the school’s students are from one U.S. state. This is a conservative measure of online enrollment because many schools offer online degree programs through their in-person branches (see Deming, Goldin and Katz (2012) for more details). Figure 1 plots estimated yearly enrollment in online degree programs using this method and shows the significant rise in these types of programs in the early-mid 2000s.

Figure 1 further divides online enrollment into two categories: 1) campuses with a significant but not complete online presence; and 2) campuses or entire institutions which are online only.[3] Between 2000 and 2006, online institutions grew from essentially zero to about 1.75 percent of all U.S. postsecondary enrollments. This growth was modestly larger for specialized online campuses.

In the four years following the end of the 50 percent rule, online schools grew from 1.75 to 4.5 percent of all U.S. enrollment. Online-only campuses and institutions accounted for about 2.1 percentage points of this increase, or about 75 percent of the growth in online enrollment over the 2006-2010 period. Moreover, the number of institutions satisfying our definition of “online” grew from 13 in 2004 to 24 in 2006 to 39 in 2010. These trends suggest that the market for online education grew rapidly and became significantly more competitive after 2006.

II. How Might Online Degrees Affect Higher Education Markets?

Online institutions affect local education markets by increasing competitive pressure. Students who previously had only a limited set of choices (or perhaps no choice at all) now can choose to enroll in online institutions instead. This increase in the number of options available to students means that local schools no longer have monopoly power, and must compete for students. Thus the impact of online institutions should be proportional both to the amount of

[3] The first category includes central branches of “chain” for profit institutions where online students from across the country are likely to be assigned. For example, in 2009 DeVry University operated 26 campus branches across the U.S. The Illinois branch had an enrollment of 24,624, which was more than 3 times larger than the next largest branch and about 40 percent of total enrollment in DeVry. While some of these students were enrolled in the in-person Illinois branch, most were enrolled online. In contrast, University of Phoenix has a separate online campus that enrolled more than 300,000 students – about 77 percent of total University of Phoenix enrollment - in 2009. Other schools, such as Ashford University and Capella University, have only a single campus branch where nearly everyone is enrolled online.

prior market power of local institutions and to the substitutability between local nonselective schools and online degree programs.

We focus on the impact of increased competitive pressure from online schools on enrollment and resource allocation among traditional postsecondary institutions. While no prior work has examined this question, it relates closely to existing research on the competitive effects of K-12 school choice. A growing body of research examines how school choice policies affect resource levels and distribution in traditional public schools (Hoxby 2000; Hoxby 2003; Jackson 2012; Cook 2016). While these papers find that elementary and secondary schools respond to competitive pressures by changing educational inputs, the direction and magnitude of effects tends to vary.

Competition in the postsecondary market has many similarities to competition in the elementary and secondary markets, although it is distinguished along three important dimensions. First, postsecondary schools charge tuition. Thus, unlike with K-12 school choice, there is a price mechanism that can act to clear the market. Of course, most colleges and universities receive substantial state subsidies, and financial aid weakens the relationship between posted tuition and what students actually pay, but the fact that postsecondary schools, and in particular private schools, can compete over prices differentiates this setting from choice in K-12 markets.

Second, institutions of higher education have broader purposes than K-12 schools. An elementary or secondary school's main objective is to increase student learning in a small set of academic subjects. Colleges and universities also aim to increase student learning, but over a wider variety of subjects. Moreover, they also aim to produce knowledge in the form of research. Thus, higher education markets are more horizontally differentiated than their K-12 counterparts. Colleges with different objectives and different student bodies are unlikely to compete with each other. This is a key reason why we focus on nonselective schools, which offer a relatively homogenous product in a standard fee-for-service model (Hoxby 2014).

Third, non-attendance is usually not an option in the K-12 setting. In contrast, since not everyone is required to attend college, market entry of online degree programs might increase total postsecondary enrollment. This could happen through a direct effect of increasing access to college, but also indirectly - if competition raises the quality of education offerings, more students might be pulled into higher education.

Thus our first prediction is that the impact of competition from online degree programs on enrollment will be greater in markets where enrollment is more concentrated in a small number of institutions. This is because in the absence of outside competitors, local institutions with monopoly power will generally be providing a lower quality education for the price.

Our second prediction is that online degree programs should increase price competition and reduce economic rents for schools with monopoly power. Given that prices at public institutions are only weakly market driven at best, we might expect price competition to be most important for private institutions. Additionally, the introduction of a common (online) option should lead to a decline in the variance of tuition prices across local education markets. Again, this effect should be larger for private institutions.

Finally, we might also expect competitive pressure to lead to changes in institutional resource allocation, such as increased spending on instruction and/or student support services. The predicted effects for tuition and resources are linked: schools can compete on both prices and quality, but they might not do so equally. If competition is mainly over quality, tuition prices actually could increase. This might occur in an environment where tuition is subsidized by financial aid, making the actual prices faced by prospective students less salient. Thus, how postsecondary schools will respond to heightened competition is determined in part by the factors over which they compete.

III. Data

Our main source of institutional data for this study is IPEDS, which contains institution-level information on enrollment, posted tuition prices, revenues, expenditures and educational resources for all U.S. postsecondary institutions that distribute Federal Title IV financial aid (Pell Grants and Stafford Loans). We collected IPEDS data at the institution-year level for years 1990-2013.[4] Our analysis is mostly restricted to years 2000-2013, which provides several years in which online degree programs prevalence was low and also insulates us from biases related to many changes in how IPEDS measures core variables of interest in the 1990s. Using 2000 as our base year also allows us to obtain market concentrations that are not affected by online degree programs, but that are recent enough to accurately reflect market power in later years.

[4] We refer to school years by the calendar year of the spring term. For example, we refer to school year 2012-2013 as 2013.

It is important to distinguish selective from nonselective institutions in our context because selective schools are much more geographically integrated, which means they have considerably less market power (Hoxby 2009, 2014). In 2000, 44.3 percent of first-time freshmen in selective four-year institutions were from out-of-state, compared to only 15.2 percent in less selective four-year publics and 7.5 percent in community colleges. Additionally, most online programs are open enrollment – very few practice selective admissions.[5] As a result, schools that have selective admissions policies are unlikely to be in direct competition with online degree programs. We therefore focus on less- or non-selective institutions that serve highly local markets, which we define as any institution that has a rating of Most Competitive, Highly Competitive or Very Competitive according to the 2009 Barron's Profile of American Colleges.

III.A. Measuring Market Concentration

There is little reason to expect that the distribution of public institutions across metropolitan areas reflects a competitive equilibrium. While private colleges may enter markets endogenously in response to potential profit opportunities, the location of public institutions largely reflects historical and political factors. There has been almost no new entry of public colleges in the U.S. over the last 25 years. Many public institutions are located in non-urban areas that would not otherwise support a market for higher education – for example, in 2013, 18 percent of non-selective public enrollment was in non-urban areas, compared to only 8 percent for private non-selective institutions.

The uneven distribution of colleges and universities across areas in the US drives heterogeneity in the competitive effects of online postsecondary programs. To measure local market power, we first define a postsecondary market as the MSA in which a school is located. If a school is not located in an MSA, we define the market as the county. This definition thus acknowledges that students have more options in cities and can easily move across counties within the city to enroll. In less urban areas, the local schooling option is typically the community college or the non-selective four-year school located in one's county.

Our measure of market concentration is the Herfindahl index of enrollment shares. The Herfindahl index is a measure of the extent to which enrollment is spread out evenly among many postsecondary schools or whether it is concentrated in one or only a couple schools. It is

[5] In our data, only one online-only institution reports practicing selective admissions – Grand Canyon University.

preferable to raw counts of the number of different types of schools because it takes into account the size of enrollment at each local school; a small school affects local competition less than a larger school. Formally, the Herfindahl index is the sum of squared enrollment shares across schools within a market:

$$H_j = \sum_{i=1}^{N_j} E_{ij}^2,$$

where E_{ij} is enrollment in institution *i* in market j and N_j is the total number of schools in market j; $H \in [0,1]$, with values closer to 1 indicating less competition (more concentrated enrollment).

We calculate Herfindahl indices using enrollment in all non-selective schools in a market as well as separately by level (two-year, four-year) and control (public, private) using 2000 data. Thus, H_j is a fixed characteristic of the market that does not change over time. Table 1 provides means of Herfindahl indices and other analysis variables of interest. The mean Herfindahl index value is about 0.31. However, the standard deviation is also about 0.31, suggesting that there is a lot of variation in college concentration across markets. Private schools on average have less market power, with a mean Herfindahl index if 0.29. Table 1 also shows that for a small number of local markets sector-specific Herfindahl indices cannot be calculated because there is no school of that type in the market in 2000.

Figures 2 and 3 show the geographic distribution of market shares by MSA and by county, respectively. In the cases where the counties in Figure 3 overlap with an MSA in Figure 2, the MSA is the relevant market. The different shading in each Figure 2 corresponds to quartiles of the Herfindahl index. For counties, over 40% have a Herfindahl index of 1. We therefore split counties into terciles of the distribution with an index value less than 1 and then a category with only single-school counties. As expected, there is much higher market concentration when markets are defined as counties rather than MSAs. The main conclusion from these figures is that there is considerable variation in local market power across space and that there is little geographic clustering of market power. Thus, our market power measures are not simply picking up unobserved aspects of higher education markets that are correlated with geographic region or state.

Figures 2 and 3 also demonstrate that many areas of the country are characterized by considerable nonselective market power. Among MSAs, the top quartile has a Herfindahl index above 0.68 and among counties it is 0.94. In contrast, the bottom quartile of the distribution has little market power, especially among MSAs. Thus, there is much geographic variation in the scope for online postsecondary options to have competitive effects on local higher education markets.

III.B. Measuring Internet Penetration Rates

Internet penetration rates are calculated at the state-year level using the Current Population Survey (CPS). Beginning in 1989, the CPS has included questions in various forms about Internet access and usage. These questions were asking in 1989, 1993, 1997, 1998, 2000, 2001, 2003, 2007, 2009, 2010 and 2012. We follow the approach developed in Goolsbee, Lovenheim and Slemrod (2010) to construct a state-year panel of Internet access rates that accounts for the fact that the wording of the question changes over time. In 1989 and 1993, a respondent is defined as having Internet access if he reports that he has e-mail or a computer with a modem. In the 1997-2003 surveys we code a respondent as having Internet access if she responds that she has access to the Internet at home, school or work. Post-2003, the CPS directly asks if respondents have Internet access. Between survey years, state-level Internet penetration rates are linearly interpolated.

Figure 4 contains trends in Internet penetration rates between 1989 and 2012 for the highest- and lowest-Internet penetration state in each year. The maximum and minimum state changes over time, so the figure also shows which state provides each observation. Internet access is generally trending upward strongly over this period, but it is doing so unevenly across states. Thus, there is significant cross-state variation in the time pattern of Internet access. Below, we explore whether this time pattern is related to postsecondary outcomes among nonselective schools in a state, and in particular whether changes in Internet penetration rates have differential impacts after 2006 when the supply of online enrollment options increased.

IV. Empirical Strategy

We first examine how postsecondary outcomes change after 2006 as a function of 2000 market concentrations in a difference-in-difference setting. In particular, we estimate the following regressions at the institution-year level:

$$Y_{ismt} = \alpha + \beta_1 (H_m * POST_t^{2006}) + \beta_2 X_{imt} + \delta_i + \theta_{st} + \varepsilon_{ismt} \quad (1)$$

where i indexes institutions, s indexes state, m indexes market (county or MSA) and t indexes year. H_m is the nonselective market Herfindahl index in 2000. We control for time-varying characteristics of institutions and markets (such as the local unemployment rate), institution fixed effects (δ_i) and state-by-year fixed effects (θ_{st}). Note that the main effect of H_m is absorbed by the institution fixed effects, since institutions do not move across markets. Standard errors are clustered at the market level throughout.

The coefficient of interest in this equation is β_1, which shows how the relationship between market power (as measured by the Herfindahl index) and postsecondary outcomes changes in 2006 when online programs became more prevalent. Similar to any difference-in-difference design, this approach embeds two main assumptions: 1) schools in markets with different levels of market power would have exhibited similar trends absent the rise of online programs and 2) there are no shocks or policies that occur after 2006 that differentially affect markets with different values of H_m.

We provide evidence on the validity of the first assumption by estimating event studies of the following form:

(2) $$Y_{ismt} = \alpha + \sum_{j=2000}^{2013} \gamma_j H_m * I(t = j) + \beta_2 X_{imt} + \delta_i + \theta_{st} + \varepsilon_{ismt}.$$

This model estimates a separate coefficient on H_m in every year, and the coefficients $\gamma_{2000} - \gamma_{2005}$ provide evidence on whether there are differential pre-2006 trends as a function of 2000 market share. Note that our model does not necessarily predict a sharp break in 2006, since online schools were growing in prevalence prior to 2006. However, the 2006 regulatory change sped up the rate of entry of online programs. We therefore expect a shift in how 2000 market shares relate to postsecondary outcomes after 2006, but we do not have strong priors on the time pattern of such a shift. Furthermore, they are likely to be some pre-treatment trends that reflect the rise of online programs prior to 2006.

The second assumption is much more difficult to test. We control for market-year level observable characteristics to account for any compositional changes across areas that may be correlated with 2000 market shares. Because we cannot perfectly test the assumptions underlying our preferred approach, we implement a second empirical strategy that uses differences in Internet penetration rate changes across states. While this approach relies on assumptions about the exogeneity of Internet penetration rate changes, these assumptions differ substantially from those needed to justify our preferred approach. To the extent that the estimates from both methods are similar, this alternate approach provides support for our results.

We estimate difference-in-difference models that examine how the relationship between Internet penetration rates in state *I* and year *t* (I_{st}) changes in 2006:

(3) $$Y_{ismt} = \alpha + \beta_1(I_{st} * POST_t^{2006}) + \beta_2 X_{imt} + \beta_3 I_{st} + \delta_i + \theta_t + \varepsilon_{imt}.$$

Note that I_{st} varies over time within state. The identifying variation in this model thus comes both from changes in the relationship between Internet penetration rates and postsecondary outcomes in 2006 and from changes in Internet penetration rates with states. The main assumption underlying this model is that the only reason the relationship between I_{st} and outcomes changes in 2006 is because of the growth of online education. We also need to assume that there are no shocks or other policies that occur in 2006 which are correlated with I_{st}. Because I_{st} and H_m are not highly correlated – the correlation coefficient between the Herfindahl index and the growth in Internet penetration between 2000 and 2012 is -0.05 – it is highly unlikely that any unobserved shock that would bias the first approach would also bias the second approach in the same direction. Together, these two identification strategies give significant insight into how schools respond to pressure from online competitors.

V. Results

V.A. Enrollment

Table 2 shows estimates from equation (1) of the impact of post-2006 online competition on enrollment. Panel A present results in levels, and Panel B shows the natural log of enrollment. Because of the large variance in enrollment, we prefer the log estimates. However, we present both for completeness. Column 1 presents pooled results for all non-selective colleges. Columns 2 and 3 present results for public and private enrollment (including both not-for-profit and for-profit institutions), while Columns 4 and 5 split by four-year and two-year colleges respectively.

We find consistent evidence across specifications that less competitive markets experienced relative declines in enrollment after the expansion of online degree programs. A one standard deviation increase in market concentration (0.31, as measured by the H-index) leads to a decline in post-2006 enrollment of 109 students, or about 2 percent. We find larger impacts for private institutions; a one standard deviation increase in market concentration reduces enrollment by 2.5 percent (or 152 students) post-2006. Public schools in Panel A show evidence of a sizable and statistically significant decline in enrollment, but the results in Panel B indicate these results are not robust to measuring enrollment in logs. This is likely because of the existence of some very large public schools, which have an undue influence on the estimates in Panel A. We thus conclude that enrollment in public schools does not respond to competitive pressures overall. The last two columns show that effects are similar in percentage terms for 4-year and 2-year schools; a one standard deviation increase in the Herfindahl index leads to an enrollment reduction of about 2% after 2006.

Figure 5 presents estimates of equation (2) graphically, following the less restrictive specification in equation (2). When we allow the impacts of market concentration to vary by year, we find a borderline significant decline of about 7 percent in log enrollment for private institutions in 2007, exactly one year after the end of the 50/50 rule. The coefficients remain negative in every year from 2007 to 2013. In contrast, we find no statistically significant impact on log enrollment at public institutions for any year after 2006, which is consistent with the evidence in Panel B of Table 4.

V.B. Tuition

In Section II, we predicted that competition from online degree programs would cause price convergence across local education markets. Figure 6 presents some initial evidence on this question by plotting the enrollment-weighted coefficient of variation (the standard deviation divided by the mean) for tuition in public and private non-selective schools between 1990 and 2013. Figure 6 shows that variation in tuition at private non-selective institutions held steady throughout the 1990s, but started to decline in the early 2000s. In contrast, there is little change in the variance of tuition at public institutions over this period.

While time series evidence is suggestive, in Table 3 we present estimates of equation (1) with tuition as the outcome to more closely link any tuition changes with underlying market shares. Because public tuition is not primarily determined by market competition, we focus on private institutions. Column 1 presents results for all private schools, while Columns 2 and 3 focus on private four-year and two-year institutions, respectively.

Surprisingly, we find little evidence that competition from online institutions lowers tuition in more concentrated markets. The coefficients in Column 1 are positive but are not statistically significant at even the 10% level. They suggest a small positive effect on average tuition of about 0.5 percent (or $83) for a one standard deviation increase in the H-Index. There is a negative but not significant effect for private 2-year schools in column (3) that is very small in absolute value, while the results in Column 2 actually imply *increases* in private four-year tuition in more concentrated markets. Figure 7 shows event study estimates for nonselective private schools. These results show that private tuition increases as a function of 2000 market share after 2006, with the majority of the increases coming after 2009. Furthermore, there is little evidence of pre-2006 differential trends in tuition that would lead to a bias in our estimates.

What could explain the positive effect on private sector tuition? One explanation is that the enrollment declines in Table 2 force private colleges to charge more to cover marginal costs. That is, private schools must raise tuition in order to make up for the loss in resources associated with declining enrollment. Another explanation is that price competition is not particularly strong in higher education markets where enrollment is heavily subsidized by Federal Pell Grant and Stafford Loan dollars and is not very salient to consumers. This suggests that schools will compete over other features, such as resources. While these explanations are not mutually exclusive, we lack the ability to distinguish them in the data.

Panel C shows the impact of online competition on market-level variation in tuition prices. The dependent variable is the absolute difference between the institution's posted tuition and the national average tuition divided by the national average tuition. Thus, the estimates yield the effect of increased competition on the coefficient of variation (the standard deviation divided by the mean). Interestingly, the estimates indicate an *increase* in price dispersion post-2006 as a function of 2000 market share. These estimates are driven by private 2-year schools, where a 1 standard deviation increase in the H-index leads to a 1.4 percentage point increase in the coefficient of variation. Again, this evidence suggests schools likely are not competing over posted prices,[6] which is sensible given the sizable subsidies offered to students through the financial aid system. Indeed, if prices are difficult for students to observe, higher competition could cause an increase in posted prices that are driven by university expansions in in educational resources.

[6] It is possible these schools are competing over net price with institutional aid. However, nonselective schools in general and 2-year schools in particular tend to offer little institutional aid.

IV.C. Spending

Table 4 presents estimates of equation (1) where the outcomes are expenditures (Panel A), instructional expenditures (Panel B) and revenues (Panel C) per student. Given the enrollment declines shown in Table 2, there can be a mechanical positive effect on per-student expenditures if expenditures react slowly to enrollment changes or if expenditures are nonlinear in enrollment. However, we view it as unlikely that all of the resource changes we document are due to enrollment effects.

As in Table 2, we show results for all non-selective schools as well as separately for public and private schools and for 2-year and four-year schools. Because there is a lot of variation in expenditures, these estimates are necessarily noisier than those discussed above. But, we find evidence that expenditures per student rise as a function of 2000 market share post-2006. This is particularly the case for instructional expenditures, for which a 1 standard deviation increase in market share leads to an increase in instructional expenditures per student of 1.6%, or $2,976. As shown in Table 1, there is a very large standard deviation associated with these outcomes, so we favor the log model; we focus on these although we present both for interested readers. The effect on instructional expenditures is largest for 4-year schools (2.9% for a 1 standard deviation increase in the H-index) and for public schools (1.8% for a 1 standard deviation increase in the H-index). The estimate for two-year schools is positive but is not statistically significant at conventional levels, while there is evidence of a small negative decline in spending among private schools.

Figure 8 shows event studies for instructional expenditures per student. The estimates are somewhat imprecise, but there is a clear increase in the relationship between the 2000 H-index and instructional expenditures per student after 2006, most of which occurs after 2009. These results are consistent with the high prevalence of online schooling options over this period (see Figure 1).

The results for overall spending per student are consistent with those for instructional spending but are less precise. The one exception to this generalization is that overall we see a reduction in overall spending due to increased competition, which is driven completely by the private sector. Panel C shows that the expenditure declines in the private sector we document are driven in large part by revenue changes per student. Both private and 2-year schools experience significant declines in revenues due to heightened competitive pressures. Private schools, and to somewhat a lesser extent 2-year school, tend to be heavily reliant on tuition funding. Table 2 shows these schools experience sizable declines in enrollment when there is increased competition. As a result, they raise their tuition, as shown in Table 3. Their tuition increases, however, are not enough to counteract the revenue effects of declining enrollment. Comparing the revenue changes to the expenditure changes, a story emerges wherein private and two-year schools are shifting resources towards instruction, they just face increasingly-binding financial constraints that reduce the total amount of resources they can use to compete with the online sector.

In contrast, public schools and four-year schools do not experience changes in revenues. This could be because state appropriations counteract reductions in tuition revenue from enrollment declines in the four-year sector (we do not see a consistent enrollment effect in the public sector). It also is the case that four-year schools tend to be less reliant on tuition revenues, which reduces their exposure to revenue losses when enrollment declines. Despite the lack of a revenue effect, instructional expenditures per student rise considerably. This suggests that public schools may respond to threat from online competitors by increasing the breadth of course offerings, lowering class sizes, or other instructional expenses. Unfortunately, the IPEDS data do not allow us to examine more specific categories of instructional spending.

IV.D. Heterogeneity in Market Power Across Sectors

Throughout the analysis, we have characterized competition using nonselective enrollment concentrations. This aggregation may miss important heterogeneity in market power across sectors. As Table 1 shows, private schools tend to have less market power than public schools. If schools in these sectors compete within but not across sectors, our aggregation of all enrollments will miss important aspects of how competition operates. In Table 5, we present results from a model similar to equation (1) but where we control separately for the private H-index and the public H-index interacted with a post-2006 indicator. We also separately control for the interaction of post-2006 and indicators for whether the market is missing each H-index. This occurs when the market does not have a school of the given type in it in 2000.

Panel A shows log enrollment estimates; the results load completely on the private sector H-index. The enrollment effect on all nonselective schools is larger than the effect in Table 2, at 2.5 percent for a one standard deviation change in the private Herfindahl index (0.29). Reassuringly, market concentration of private institutions has a larger impact on private college enrollment, although the impact for public institutions is also statistically significant. While both private and public schools experience enrollment declines due to heightened competition in the private sector, the effect is over three times larger in the private sector: A one standard deviation increase in the private institution H-index leads to a decline in private college enrollment of about 3.9 percent, compared to only 1.2 percent for public enrollment. In contrast, we find no evidence that increased concentration of public institutions affects enrollment after 2006.

We also find some evidence that market concentration of private colleges leads to relative increases in per-student spending and instructional spending after 2006, although the results are not statistically significant. In the last two columns of the table, we provide estimates separately for the public and private sectors. In both columns, per-student instructional expenditures increase post-2006 when own-sector 2000 market concentrations are higher. The results imply an impact of 2.8 percent in the public sector and 1.6 percent in the private sector for a standard deviation in the sector-specific Herfindahl index. However, only the public sector estimate is statistically significant at even the 10 percent level.

Table 5 also shows that per-student instructional expenditures decline with cross-sector increases in market competition. This provides suggestive evidence that increases in competitive pressures from online schools leads to less competition among local providers when the postsecondary market is highly concentrated outside of a school's own sector. The total expenditure estimates tell a similar story, except both coefficients are positive (but not statistically significant) for the public sector.

V. Results from Internet Penetration Variation

Finally, in Table 6 we present results from a complementary identification strategy that exploits state-by-year variation in Internet penetration, following equation (3). This identification strategy has considerably less power than our preferred approach, so we only show estimates for all nonselective schools. Despite the reduced statistical power, these results present supporting evidence that is important given the potentially strong assumptions underlying casual identification in equation (1).

The results in Table 6 are qualitatively similar to those shown above. A 10 percentage point increase in the Internet penetration rate post-2006 leads to a 0.7% reduction in nonselective enrollment and an increase of $1,587 per student in instructional expenditures. We also find positive coefficients on overall expenditures and revenues per student. Only the instructional expenditures effect is significant at even the 10% level. While imprecise, the fact that these results are broadly consistent with our baseline estimates suggests our conclusions are not being overly affected by biases driven by differential trends or shocks correlated with 2000 market shares and with the timing of federal guidelines supporting online postsecondary options.

VI. Conclusion

In this paper we study the impact of increased competition from online degree programs on traditional postsecondary institutions. Following a regulatory change that increased the market entry and enrollment of online institutions after 2006, local schools in less competitive markets experienced relative declines in enrollment. The impacts on enrollment were concentrated among less selective private institutions that are likely to be online schools' closest competitors. We also find that institutions responded to competitive pressure by increasing instructional spending, a broad proxy for quality. These impacts are driven by public institutions, suggesting that they also felt pressure to improve quality in response to online competition. In contrast, we find no evidence that increased competition lowered prices for in-person degree programs, perhaps because Federal Title IV subsidies weaken price competition in higher education.

Our results show the importance of thinking broadly about the impact of online degree programs on U.S. higher education. Several recent studies have found that online courses and degree programs lead to less learning, lower degree completion rates and worse labor market outcomes. However, our findings suggest that online education can be an important driver of innovation and productivity in U.S. higher education even if (at least at the time of writing) online institutions are producing a lower quality product. Our results provide preliminary evidence that the threat of "disruption" from online education may cause traditionally sluggish and unresponsive institutions to improve quality or risk losing students. Another direct benefit –

unexamined in this paper – is the impact of online schools on access to higher education for students who do not live near a traditional campus or who must enroll during irregular hours. While we are still in early days, online degrees are likely to be a truly disruptive force in the market for U.S. higher education, and so they remain an important topic for future work.

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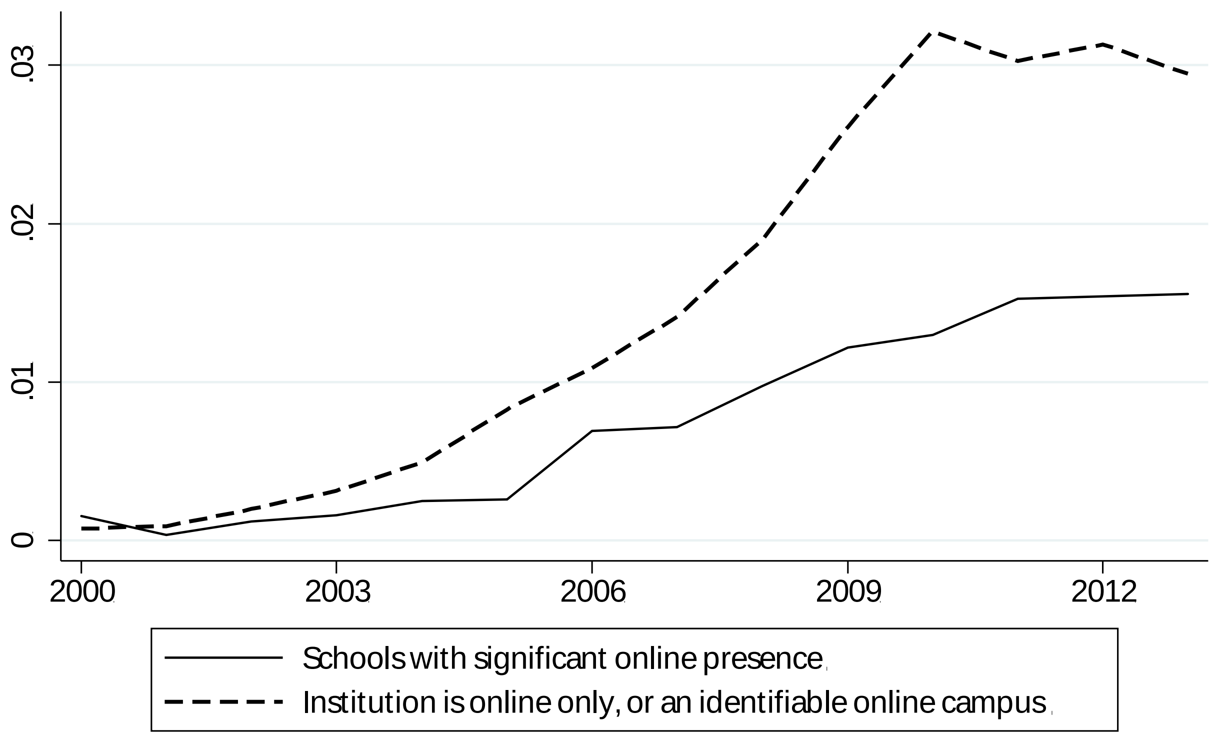
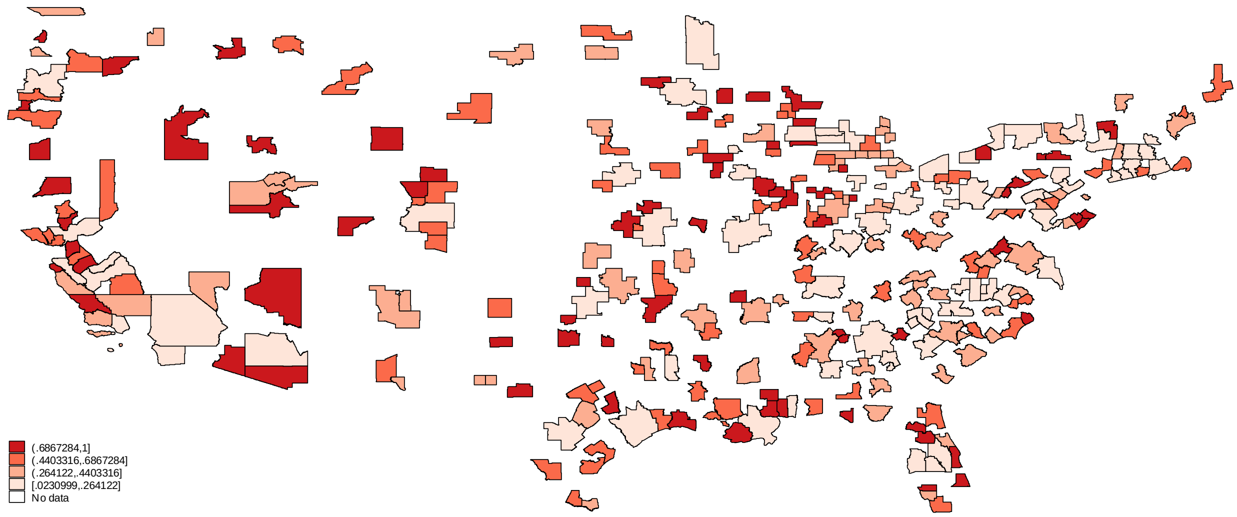
Figure 1. Increasing Specialization of Online Degree Programs: Share of Total U.S. Enrollment in Online Degree Programs, by year



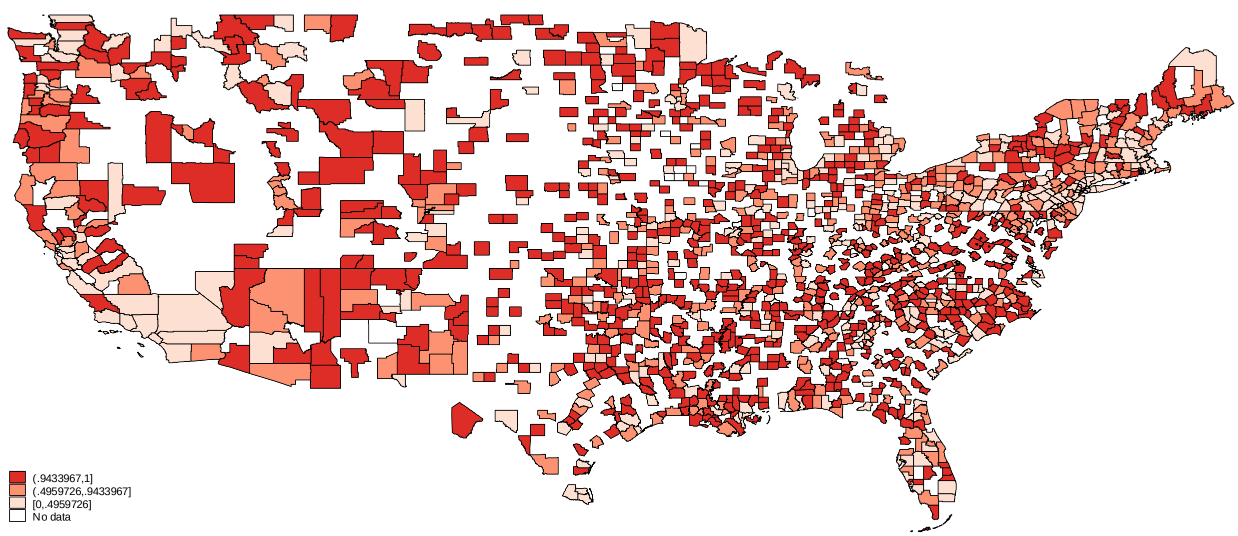
Source: IPEDS

Figure 2. Herfindahl Indices of Non-selective School Market Share by City



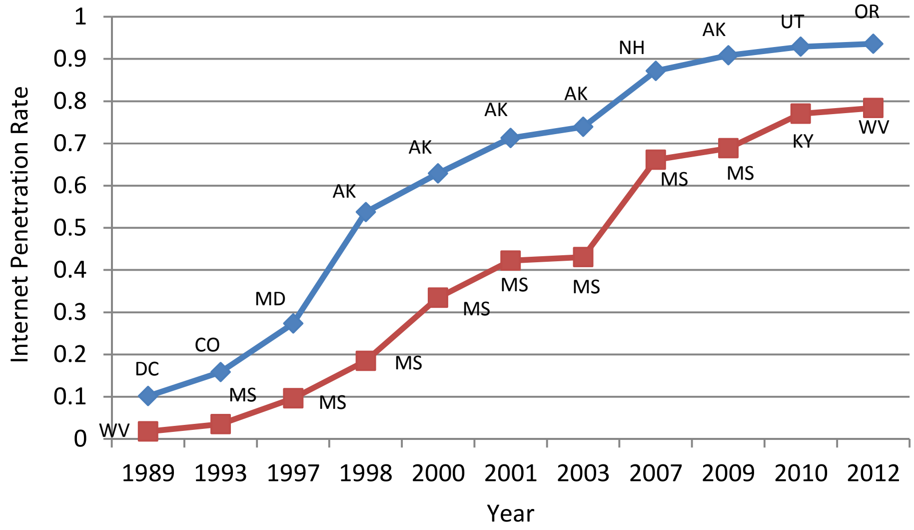
Source: Authors' calculations from 2000 IPEDS. Non-selective schools are those with an admissions profile below "Very Competitive" in the 2009 Barron's Profile of American Colleges.

Figure 3. Herfindahl Indices of Non-selective School Market Share by County



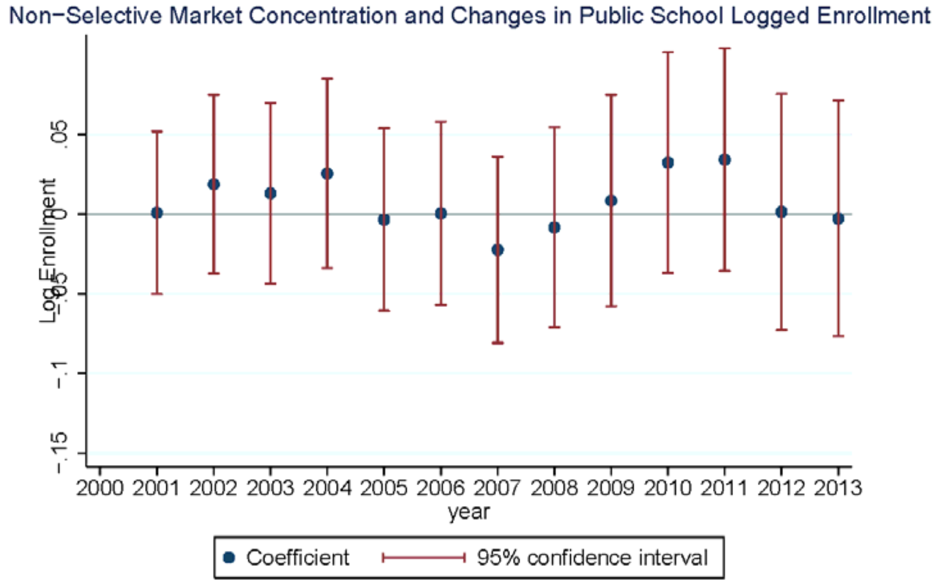
Source: Authors' calculations from 2000 IPEDS. Non-selective schools are those with an admissions profile below "Very Competitive" in the 2009 Barron's Profile of American Colleges.

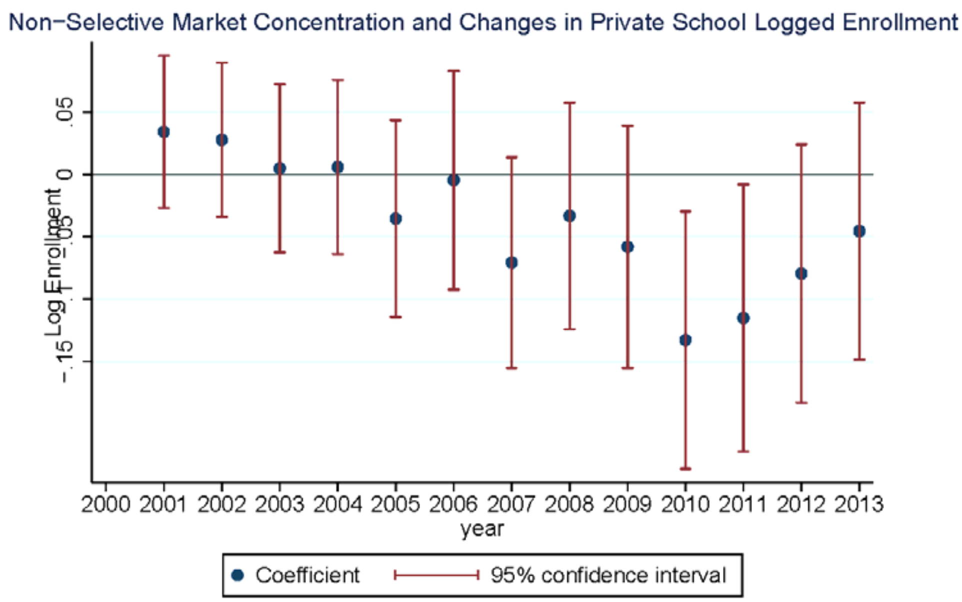
Figure 4. Internet Penetration Rates



Source: 1989, 1993, 1997, 1998, 2000, 2001, 2003, 2007, 2009, 2010 CPS data as described in the text. The state listed next to each data point shows the state with the highest (diamond) and lowest (square) Internet penetration rate in that year.

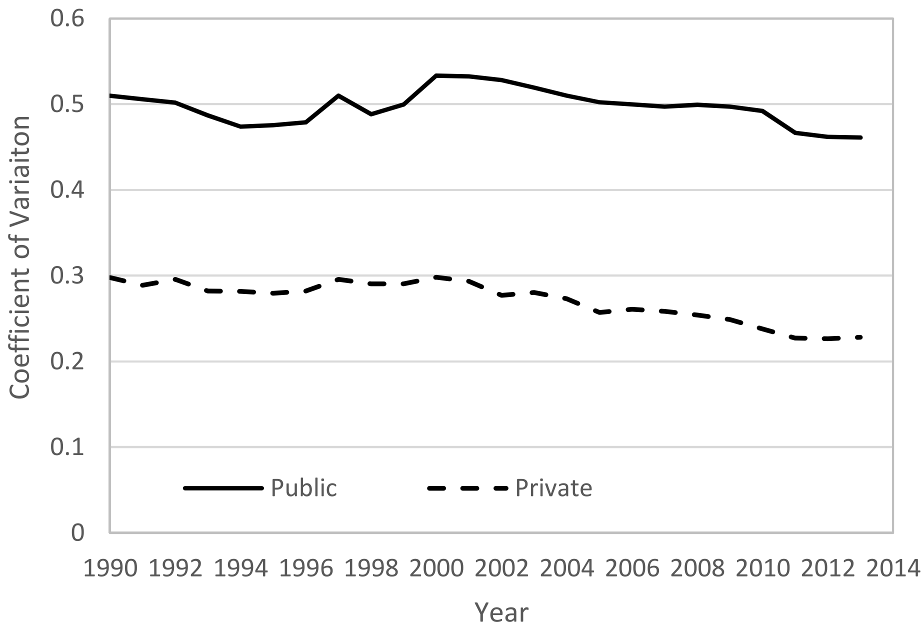
Figure 5. The Effect of Online Competition on Traditional School Enrollment – Event Study Estimates by School Type





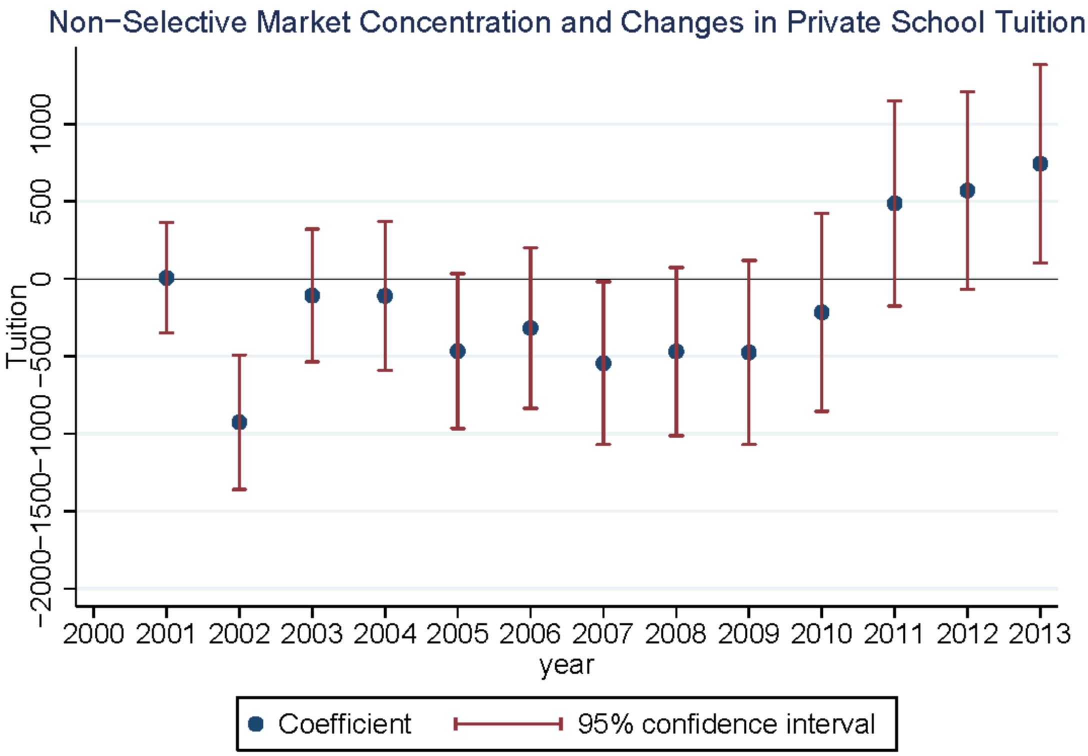
Source: Authors' estimation of equation (2) using 2000-2013 IPEDS data as described in the text. Each point is an estimate of γ_j, and the bars extending from each point show the 95% confidence interval calculated from standard errors that are clustered at the market (MSA/county) level. γ_{2000} is set to zero, so all estimates are relative to that year. Regressions control for market-year unemployment rate, total population, poverty rate, proportion black, proportion Hispanic, proportion that are veterans, and proportion male. Estimates also include state-by-year fixed effects and institution fixed effects. Herfindahl (H-) indices are for non-selective schools, which are those with an admissions profile below "Very Competitive" in the 2009 Barron's Profile of American Colleges.

Figure 6. Cross-market Coefficient of Variation in In-state Posted Tuition



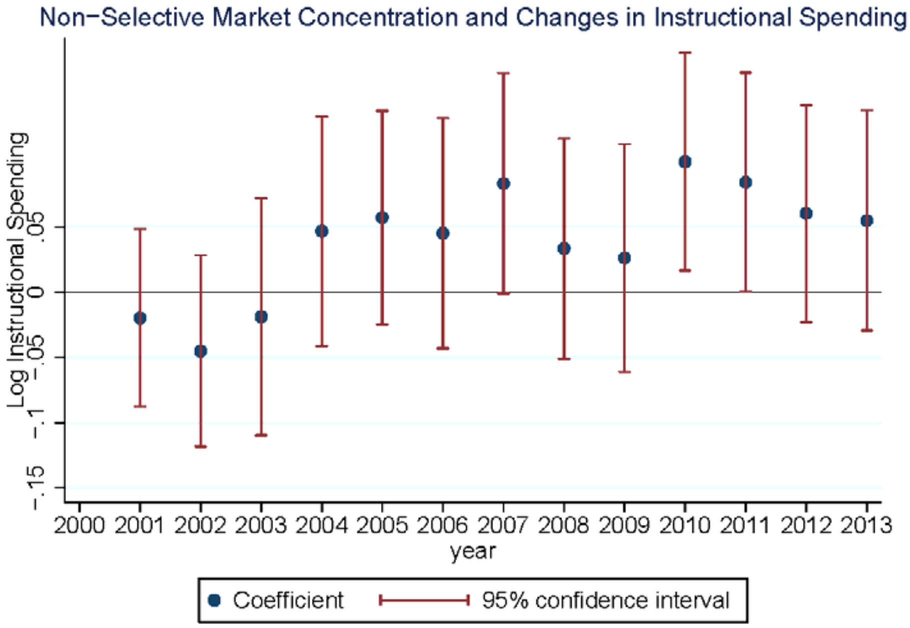
Source: 1990-2013 IPEDS. The coefficient of variation is the cross-market (MSA/county) standard deviation divided by the year-specific mean. Tuition is only for non-selective schools, which are those with an admissions profile below "Very Competitive" in the 2009 Barron's Profile of American Colleges.

Figure 7. The Effect of Online Competition on Traditional Private School Tuition – Event Study Estimates



Source: Authors' estimation of equation (2) using 2000-2013 IPEDS data as described in the text. Each point is an estimate of γ_j, and the bars extending from each point show the 95% confidence interval calculated from standard errors that are clustered at the market (MSA/county) level. γ_{2000} is set to zero, so all estimates are relative to that year. The regression controls for market-year unemployment rate, total population, poverty rate, proportion black, proportion Hispanic, proportion that are veterans, and proportion male. All estimates also include state-by-year fixed effects and institution fixed effects. Herfindahl (H-) indices are for non-selective schools, which are those with an admissions profile below "Very Competitive" in the 2009 Barron's Profile of American Colleges.

Figure 8. The Effect of Online Competition on Traditional School Resources – Event Study Estimates



Source: Authors' estimation of equation (2) using 2000-2013 IPEDS data as described in the text. Each point is an estimate of γ_j, and the bars extending from each point show the 95% confidence interval calculated from standard errors that are clustered at the market (MSA/county) level. γ_{2000} is set to zero, so all estimates are relative to that year. The regression controls for market-year unemployment rate, total population, poverty rate, proportion black, proportion Hispanic, proportion that are veterans, and proportion male. All estimates also include state-by-year fixed effects and institution fixed effects. Herfindahl (H-) indices are for non-selective schools, which are those with an admissions profile below "Very Competitive" in the 2009 Barron's Profile of American Colleges.

Table 1. Descriptive Statistics of Analysis Variables

Variable	Mean	SD
Non-selective Herfindahl Index	0.313	0.309
Public Herfindahl Index	0.404	0.322
Private Herfindahl Index	0.290	0.294
No Public Herfindahl Index	0.013	0.115
No Private Herfindahl Index	0.024	0.154
Total Enrollment	2337	5669
Log Total Enrollment	6.219	1.845
In-State Tuition	11,064	7,658
Log In-State Tuition	9.018	0.866
Revenues per Student	41,531	732,531
Expenditures per Student	35,354	629,447
Instructional Expenditures per Student	9,601	108,534

Source: 2000-2013 IPEDS data as described in the text. All Herfindahl indices are for non-selective schools, which are those with an admissions profile below “Very Competitive” in the 2009 Barron’s Profile of American Colleges.

Table 2. The Effect of Online Competition on Traditional School Enrollment

	Panel A: Total Enrollment				
Independent Variable	All Non-Selective	Public	Private	4-Year	2-Year
Non-selective H-Index * Post-2006	-356.0***	-730.4***	-489.3***	-467.0*	-185.6***
	(113.0)	(121.7)	(179.3)	(258.2)	(45.2)
Observations	88,169	27,075	61,094	31,747	56,422
R^2	0.048	0.276	0.036	0.075	0.103

	Panel B: Log Total Enrollment				
Independent Variable	All Non-Selective	Public	Private	4-Year	2-Year
Non-selective H-Index * Post-2006	-0.064***	-0.002	-0.080***	-0.062**	-0.059***
	(0.017)	(0.019)	(0.031)	(0.027)	(0.020)
Observations	88,169	27,075	61,094	31,747	56,422
R^2	0.130	0.232	0.130	0.144	0.137

Source: Authors' calculations as described in the text using 2000-2013 IPEDS data. Each column in each panel comes from a separate regression that controls for market-year unemployment rate, total population, poverty rate, proportion black, proportion Hispanic, proportion that are veterans, and proportion male. All estimates also include state-by-year fixed effects and institution fixed effects. Herfindahl (H-) indices are for non-selective schools, which are those with an admissions profile below "Very Competitive" in the 2009 Barron's Profile of American Colleges. Standard errors clustered at the market (MSA/county) level are in parentheses: *** indicates statistical significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 1% level.

Table 3. The Effect of Online Competition on In-State Posted Tuition among Private Schools

Panel A: Tuition Levels

Independent Variable	Private	Private 4-Year	Private 2-Year
Non-selective H-Index *	267.9	860.7***	-264.6
Post-2006	(182.7)	(278.6)	(242.3)
School-year observations	53,744	18,780	34,964
Unique schools	5,977	4,345	1,971
R^2	0.254	0.254	0.320

Panel B: Log Tuition

Independent Variable	Private	Private 4-Year	Private 2-Year
Non-selective H-Index *	0.0169	0.0354***	-0.006
Post-2006	(0.0118)	(0.0136)	(0.0181)
School-year observations	53,731	18,775	34,956
Unique schools	5,971	1,968	4,342
R^2	0.318	0.360	0.329

Panel C: Tuition Coefficient of Variation

Independent Variable	Private	Private 4-Year	Private 2-Year
Non-selective H-Index *	0.036***	0.0069	0.046***
Post-2006	(0.010)	(0.012)	(0.015)
School-year observations	53,744	18,780	34,964
Unique schools	5,977	4,345	1,971
R^2	0.034	0.098	0.185

Source: Authors' calculations as described in the text using 2000-2013 IPEDS data. Each column in each panel comes from a separate regression that controls for market-year unemployment rate, total population, poverty rate, proportion black, proportion Hispanic, proportion that are veterans, and proportion male. All estimates include state-by-year fixed effects and institution fixed effects. The coefficient of variation is the squared deviation from the national year-specific mean divided by the national year-specific mean. Herfindahl (H-) indices are for non-selective schools, which are those with an admissions profile below "Very Competitive" in the 2009 Barron's Profile of American Colleges. Standard errors clustered at the market (MSA/county) level are in parentheses: *** indicates statistical significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 1% level.

Table 4. The Effect of Online Competition on Traditional School Resources

Dep. Var. Form	Independent Variable	All Non-Selective	Public	Private	4-Year	2-Year
		Panel A: Total Expenditures per Student				
Level	Non-selective H-Index * Post-2006	32,662***	71,188***	10,363	38,751**	33,222***
		(10,484)	(26,988)	(7,953)	(19,393)	(12,203)
Log	Non-selective H-Index * Post-2006	-0.034*	0.0151	-0.048**	0.036	0.014
		(0.020)	(0.033)	(0.029)	(0.049)	(0.039)
		Panel B: Instructional Expenditures per Student				
Level	Non-selective H-Index * Post-2006	9,600*	31,297***	316.1	4,622**	14,231**
		(5,114)	(11,678)	(343.3)	(2,301)	(7115)
Log	Non-selective H-Index * Post-2006	0.0521**	0.0583*	-0.0119	0.0915***	0.0298
		(0.0230)	(0.0338)	(0.0345)	(0.0222)	(7,834)
		Panel C: Total Revenues per Student				
Level	Non-selective H-Index * Post-2006	49,227***	94,547**	21,155*	79,296	36,598***
		(18,109)	(45,246)	(11,731)	(49,943)	(13,672)
Log	Non-selective H-Index * Post-2006	-0.050***	0.004	-0.077***	-0.0033	-0.062**
		(0.018)	(0.032)	(0.028)	(0.026)	(0.025)

Source: Authors' calculations as described in the text using 2000-2013 IPEDS data. Each cell comes from a separate regression that controls for market-year unemployment rate, total population, poverty rate, proportion black, proportion Hispanic, proportion that are veterans, and proportion male. All estimates also include state-by-year fixed effects and institution fixed effects. Herfindahl (H-) indices are for non-selective schools, which are those with an admissions profile below "Very Competitive" in the 2009 Barron's Profile of American Colleges. Standard errors clustered at the market (MSA/county) level are in parentheses: *** indicates statistical significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 1% level.

Table 5. The Effect of Online Competition on Traditional Schools – Using Sector-Specific Market Share Measures

Panel A: Log Enrollment			
Independent Variable	All Non-Selective	Public	Private
Public H-Index	0.00789	0.0332	0.0599*
	(0.0303)	(0.0240)	(0.0364)
Private H-Index	-0.0842***	-0.0422*	-0.131***
	(0.0248)	(0.0216)	(0.0440)
Panel B: Log Expenditures per Student			
Independent Variable	All Non-Selective	Public	Private
Public H-Index	0.0072	0.0159	-0.0943***
	(0.0344)	(0.0435)	(0.0351)
Private H-Index	0.0233	0.0182	0.0386
	(0.0291)	(0.0339)	(0.0384)
Panel C: Log Instructional Expenditures per Student			
Independent Variable	All Non-Selective	Public	Private
Public H-Index	0.0114	0.0882*	-0.0889**
	(0.0522)	(0.0451)	(0.0398)
Private H-Index	0.0435	-0.0267	0.0566
	(0.0366)	(0.0370)	(0.0431)

Source: Authors' calculations as described in the text using 2000-2013 IPEDS data. Each column in each panel comes from a separate regression that controls for market-year unemployment rate, total population, poverty rate, proportion black, proportion Hispanic, proportion that are veterans, and proportion male. All estimates also include state-by-year fixed effects and institution fixed effects. Herfindahl (H-) indices are for non-selective schools, which are those with an admissions profile below "Very Competitive" in the 2009 Barron's Profile of American Colleges. Standard errors clustered at the market (MSA/county) level are in parentheses: *** indicates statistical significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 1% level.

Table 6. The Effect of Online Competition on Traditional Schools- Internet Growth

Independent Variable	Enrollment	Log Enrollment	Expenditures per Student	Instructional Expenditures per Student	Revenues per Student
Internet Rate	-2368*	0.056	85,061	33,267	83,102
	(1,276)	(0.173)	(70,333)	(37662)	(76,762)
Internet Rate* Post-2006	64.91	-0.074	34,453	15,872**	22,297
	(543.7)	(0.151)	(12,0974)	(11,868)	(124,303)

Source: Authors' calculations as described in the text using 2000-2013 IPEDS data. Each column comes from a separate regression that controls for state-year unemployment rate, total population, poverty rate, proportion black, proportion Hispanic, proportion that are veterans, and proportion male. All estimates include institution and year fixed effects. The estimation sample includes all non-selective schools, which are those with an admissions profile below "Very Competitive" in the 2009 Barron's Profile of American Colleges. Standard errors clustered at the state level are in parentheses: *** indicates statistical significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 1% level.